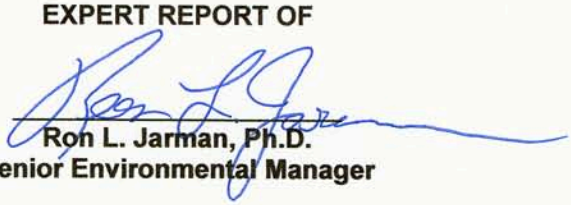
UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, ex rel. W.A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA and OKLAHOMA SECRETARY OF THE ENVIRONMENT J. D. Strong, in his capacity as the TRUSTEE FOR NATURAL RESOURCES FOR THE STATE OF OKLAHOMA,	)	
Plaintiffs,	)	
v.	)	**Case No.** 05-CV-329-GKF-SAJ
TYSON FOODS, INC., INC., TYSON POULTRY, INC., TYSON CHICKEN, INC., COBB- VANTRESS, INC., AVIAGEN, INC., CAL-MAINE FOODS, INC., CAL-MAINE FARMS, INC., CARGILL, INC., CARGILL TURKEY PRODUCTION, LLC, GEORGE'S, INC., GEORGE'S FARMS, INC., PETERSON FARMS, INC., SIMMONS FOODS, INC., and WILLOW BROOK FOODS, INC.,	)	
Defendants.	)	

EXPERT REPORT OF



Ron L. Jarman, Ph.D.
Senior Environmental Manager

Apex Companies, LLC

December 1, 2008

TABLE 1

POTW Wastewater Treatment Summary

WWTP	PERMIT NUMBER	CURRENT PERMIT TERM	LOCATION DESCRIPTION	RECEIVING WATERS	TREATMENT PROCESS	DISINFECTANT METHOD
Fayetteville - West	AR0050288	December 2005 - November 2010	North of Highway 62 and Farmington, South of Persimmon Street at 15 South Broyles Avenue, in Section 14, Township 16 North, Range 31 West in Washington County, Arkansas.	Goose Creek, then to the Illinois River, then to the Arkansas River in Segment 3J of the Arkansas River Basin.	Primary clarification, Aeration Basins with RAS and Anaerobic zones, Secondary clarification, Sand filtration.	Ultraviolet Light.
Fayetteville - Noland West	AR0020010	June 2006 - May 2011	North on Highway 71B, then east on Highway 45 to Fox Hunter Road, then 1.7 miles on North Hunter Road, in Section 7 and 8, Township 16 North, Range 29 West in Washington County, Arkansas.	Outfall 002: Unnamed tributary of Mud Creek, then to Mud Creek, then to the Illinois River in Segment 3J of the Arkansas River Basin	Coarse screens, fine screens, grit chamber, primary clarifiers, advanced biological nutrient removal systems utilizing anaerobic and oxic chambers, secondary clarifiers, alum precipitation, sand filters, and post aeration.	Ultraviolet Light.
Springdale	AR0022063	April 2004 - March 2009	Northwest Springdale on Spring Creek at 2910 Silent Grove Rd, in Section 22, Township 18 North, Range 30 West in Benton County Arkansas.	Spring Creek, then to Osage Creek, then to Illinois River in Segment 3J of the Arkansas River Basin.	Screening, Vacuators, Clarifiers, Trickling filters, Advanced Biological Treatment followed by final clarification.	Chlorination/Dechlorination, Post Aeration, Equalization.
Siloam Springs	AR0020273	October 2007 - December 2009	975 Anderson, at the Northwest corner of John Brown University, in Section 36, Township 18 North, Range 34 West in Benton County, Arkansas.	Sager Creek in Segment 3J of the Arkansas River Basin, then into Flint Creek, then into the Illinois River.	Screening, grit removal, primary clarifiers, secondary treatment - parallel tricling filters, intermediate clarifier, activated sludge nitrifying contact stabilization, final clarifiers, chlorine contact chamber.	Sulphur dioxide dechlorination.
Gentry	AR0020184	May 2006 - April 2011	12351 Overdale Road, 1/4 mile Southeast of the American Electric Company (dba Southwest Electric Power Company - Flint Creek Plant), in Section 8, Township 19 North, Range 33 West, Benton County, Arkansas.	Ash pond operated by the American Electric Power Company, then into SWEPCO Reservoir, then into Little Flint Creek, then into Flint Creek in Segment 3J of the Arkansas River Basin.	High Rate Trickle Filter, Grit Chamber to Flume and Grinder, Primary Clarifier to First Stage Filter to Second Stage Filter to Final Clarifier; Chlorine Contact Tank.	Chlorination.
Rogers	AR0043397	March 2006 - February 2011	4300 Rainbow Road, 2.7 miles south of the intersection of Southeast Walton Blvd. and Southeast "C" Street in Bentonville, Arkansas in Sections 19 and 30, Township 19 North, Range 30 West in Benton County, Arkansas.	Osage Creek, then to the Illinois River, then to the Arkansas River in Segment 3J of the Arkansas River Basin.	Flow equalization, Flow measurement, Screening, Grit and Scum Removal, Five-stage Bardenpho activated sludge/Biological Nutrient Removal, Final Clarification, Chlorination/Dechlorination, and Oxygenation.	Chlorination.
Lincoln	AR0035246	October 2007 - September 2012	Approx. 3/4 mile south of the intersection of US Highway 62 and mitchell Street on the west side of Mitchell Street, in Section 31, Township 15 North, Range 32 West, Washington County, Arkansas.	Unnamed Tributary of Bush Creek, then into Bush Creek, then into Baron Fork Creek, then into the Illinois River in Segment 3 of the Arkansas River Basin.	Grit chambers and a comminutor, followed by a Primary Clarifier, Oxidation Ditches, Final Clarifiers.	Chlorination.
Prarie Grove	AR0022098	August 2004 - July 2009	10239 Bluemist Road, just off Ditmar Road and approx. one mile north of the Prairie Grove city limit, in Section 12, Township 32 West, Range 15 North in Washington County, Arkansas.	Unnamed Tributary of the Muddy Fork of the Illinois River, then to the Muddy Fork of the Illinois River, then to the Illinois River, then to the Arkansas River in Segment 3J of the Arkansas River Basin.	Grit Chamber followed by primary clarifier, oxidation ditch with trickling filters, final clarifier, UV disinfection, and postaeration.	Ultraviolet light, Post Aeration.
Tahlequah	OK0026964	July 2005 - June 2010	Northeast 1/4 of the Southeast Section 1/4 of Section 3, Township 16 North, Range 22 East, Cherokee County, Oklahoma.	Tahlequah Creek, Planning Segment No. 121700 (Waterbody ID # 121700030020).	Biological treatment by sequential batch reactor, cascade aerator, ultraviolet disinfection, and gravity filtration with a sludge treatment process consisting of gravity belt thickening, aerobic digestion and belt filter press. Sludge drying beds.	Chlorination/Dechlorination, Ultraviolet Light.
Stilwell	OK0030341	June 2001 - June 2007	Northeast 1/4 of the Southeast 1/4 of the Northwest 1/4 of Section 34, Township 16 North, Range 25 East, Adair County, Oklahoma.	Caney Creek, a point located appox. Northwest 1/4 of the Northeast 1/4 of the Northwest 1/4 of Section 14, Township 16 North, Range 25 East of the Indian Meridian, Adair County, Oklahoma. Planning Segment No. 121700 (Waterbody ID# 121700040010).	One mechanical bar screen, one grit chamber, two 1.2 million gallon aeration basins, two 1.3 million gallon final clarifiers, a chlorination/ dechlorination system, cascade aerator, one 0.241 million gallon aerobic digester, one belt filter press. Sludge disposed of by land application, with option of landfil disposal of sludge if necessary.	Chlorination.
Westville	OK0028126	July 2005 - June 2010	East 1/2 of the West 1/2 of the Southeast 1/4 of Section 7, Township 17 North, Range 26 East, Adair County, Oklahoma.	Shell Branch Tributary of the Barren Fort (Waterbody ID # 121700050180_00).	Two basin sequential batch reactor, one influent structure, two aerobic digesters, one surge re-aeration basin, UV disinfection system, sludge box with polymer feed system, sludge dewatering container, converting existing lagoons into flow stabilization basins.	Ultraviolet Light.

Sources: Arkansas DEQ, PDS Facility Summary, www.adeq.state.ar.us; U.S. EPA, Water Discharge Permits (PCS), www.epa.gov/enviro/html

TABLE 4 (Continued)

WWTP	ESTIMATE PHOSPORUS LOADING FROM IRW POTWS								
	Annual Phosphorous Loading (lb/yr)								
	1999	2000	2001	2002	2003	2004	2005	2006	2007
Springdale	79,998	91,128	101,363	80,054	73,229	36,192	34,407	20,002	8,824
Siloam Springs	33,976	32,663	30,665	29,478	26,522	23,808	30,294	29,679	30,935
Fayetteville Noland - West	4,908	5,846	3,587	3,947	4,510	5,364	5,257	6,025	3,396
Rogers	18,803	9,607	7,002	12,003	11,704	12,748	12,286	11,531	13,555
Lincoln	2,150	611	614	637	613	529	561	792	531
Prarie Grove	1,855	1,096	1,211	3,376	3,491	3,404	3,714	4,808	5,717
Tahlequah	3,008	4,109	2,586	2,743	1,668	2,612	2,791	2,355	2,831
Stillwell	-	-	1,989	4,219	2,842	2,685	2,137	1,453	1,578
Westville	1,022	860	868	1,691	1,073	636	658	647	985
TOTAL	145,720	145,919	149,885	138,148	125,651	87,978	92,106	77,296	68,352

NOTES:

TABLE 4

WWTP	ESTIMATE PHOSPHORUS LOADING FROM IRW POTWS									
	Annual Phosphorous Loading (lb/yr)									
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Springdale	46,003	53,697	49,348	50,331	61,626	60,185	66,282	65,155	59,521	53,684
Siloam Springs	23,819	27,568	26,853	18,833	30,341	27,496	27,593	28,279	31,544	31,726
Fayetteville Noland - West	7,328	11,145	9,811	11,861	8,245	8,768	5,990	4,979	5,252	5,841
Rogers	9,555	11,312	9,254	10,147	11,750	10,071	10,860	10,292	20,026	8,651
Lincoln	1,966	2,389	1,918	2,081	2,891	2,208	2,212	2,304	1,838	2,948
Prarie Grove	1,268	1,328	1,241	1,438	1,730	1,545	1,619	1,877	1,812	1,897
Tahlequah	-	-	-	-	-	-	-	-	-	1,989
Stillwell	-	-	-	-	-	-	-	-	-	-
Westville	-		-		-		-		-	
TOTAL	89,939	107,439	98,424	94,692	116,583	110,274	114,557	112,887	119,993	106,737

NOTES: Values in black are based on monthly flow and concentration averages, combined with the number of days in the corresponding months, per year.

Loading for 2007 is based on a partial year's data, and assumes consistency for overall year.

Fayetteville Noland-West Loading assumes 40% of Fayetteville Noland's loading, as the only Fayetteville Loading to reach the Illinois River.

Blue data are a function of actual flow rates (DMRs) and the average Phosphorous concentration from available DMR data.

Maroon colored data are a function of confirmed data from the Arkansas Water Resource Center for 1997 through 2001. Any other years that use these data are based on actual flows (DMR data), and the average phosphorous concentrations (derived from the 1997 to 2001 data).

TABLE 6
Land Applied Biosolids in the IRW From POTWs
Total Phosphorus (Tons)*

	Springdale	Prairie Grove	Rogers	Gentry	Tahlequah	Stilwell	Westville	Total
1989	33.76	0.20	30.91		0.00			**64.87**
1990	83.44	0.20	30.91		0.00			**114.55**
1991	83.44	0.20	30.91		4.37			**118.92**
1992	0.00	0.02	30.91		0.27		0.69	**31.89**
1993	0.00	0.20	30.91		2.79	0.76		**34.66**
1994	0.00	0.37	34.77		2.79			**37.93**
1995	0.00	46.95	30.32		3.73			**81.00**
1996	57.67	0.74	36.88		2.79	5.10	0.06	**103.24**
1997	60.60	1.05	21.68		2.79	5.10	0.06	**91.28**
1998	54.74	0.19	39.49	1.28	0.00		0.06	**95.76**
1999	62.07	0.62	34.32	0.07	0.00		0.06	**97.14**
2000	55.10	9.32	35.74		0.00		0.06	**100.22**
2001	96.20	0.25	38.27		0.00		0.06	**134.78**
2002	76.07	0.46	51.92		0.00		0.06	**128.51**
2003	2.20	0.75	65.56		0.00		0.06	**68.57**
2004	0.00	0.49	51.92		0.00		0.06	**52.46**
2005	3.06	0.49	51.92		0.00			**55.47**
2006	0.00	0.49	51.92		0.00			**52.41**
Total	**668.35**	**62.98**	**699.26**	**1.35**	**19.53**	**10.96**	**1.23**	**1,463.66**

*See footnotes

Footnotes to Land Applied Biosolids in the IRW From POTWs-Total Phosphorus

Springdale Notes:
1989 - Land applied sludge amount is lifetime to 1989, Used average phosphorus concentration for 1989 to calculate total phosphorus
1990 and 1991 - Used average dry tons/acre from 2000 of 0.78, number of acres used for land application during the 1989 time period of 2570.2, phosphorus concentration from State Report Sub-So-Con Sludge, Permit No. 3166-W, 1991 of 41,619 mg/kg
Average of years before and after subject year
Used total phosphorus from Table 2: Phosphorus outputs and inputs collected for the IRDA, Illinois River Phosphorus Sampling Results and Mass Balance Computation, Arkansas Water Resources Center

Prairie Grove Notes:
Used total phosphorus from Table 2: Phosphorus outputs and inputs collected for the IRDA, Illinois River Phosphorus Sampling Results and Mass Balance Computation, Arkansas Water Resources Center
Used average phosphorus concentrations per capita from 1992 and 1995 to calculate total phosphorus. See worksheet - Prairie Grove Estimates
Average of multiple (at least three) years before or after subject year
Average of years before and after subject year

Rogers Notes:
Used total phosphorus from Table 2: Phosphorus outputs and inputs collected for the IRDA, Illinois River Phosphorus Sampling Results and Mass Balance Computation, Arkansas Water Resources Center
Used average phosphorus concentrations per capita from 1992 and 1995 to calculate total phosphorus. See worksheet - Prairie Grove Estimates
Average of multiple (at least three) years before or after subject year
Average of years before and after subject year

Gentry Notes:
Only 2 years of available data for Gentry land application of biosolids. Location of fields used for land application is unknown.

Tahlequah Notes:
Used the average phosphorus concentrations from 1991,1992,and 1995 (13,300 mg/kg, 811 mg/kg, and 11,352 mg/kg respectively) - 8,488 mg/kg

Stilwell Notes:
Used phosphorus concentration of 7654 mg/kg from 1993
Only 1 year of available data for Stilwell phosphorus amounts.

Westville Notes:
Used phosphorus concentration of 13,925 mg/kg from 1992 to calculate total phosphorus amounts
Only 1 year of available data for Westville phosphorus amounts.

The large number of recreationists reported by the US Corps of Engineers (Badger, et al, 1976), and the OSRC (OCC-07700001919 & OSRC-083-0001087) even though seasonal and periodic, undoubtedly contribute to the waste load in the IRW.

Human activities likely to produce untreated excreta, although undesirable, have been reported as common in the heavily used Upper Illinois River recreation zone (Wagner, 1997, OSRC-083-0001087, OCC-077-0001919, OCC-068-0000637). Although both float trip operators and the OSRC provide some toilet facilities, these are not readily available from all points on the River. From my personal experience, through participating in approximately 50 days of recreational float trips on the River, it is common to observe float participants seeking a private spot for physical relief. My observations are supported by comments from OSRC Director, Ed Fite on multiple occasions (OSRC-089-0000575, OSRC-023-0000757, OSRC-043-0000216). These untreated excreta, placed directly into or adjacent to the stream channel, have a maximal opportunity to negatively impact stream water quality. Although not as prevalent, boaters, swimmers and fishermen at Lake Tenkiller may avail themselves of the same type of need. However, what they lack in opportunity, they make up for in the massive numbers of visitors at this large recreational facility

The Illinois River Access Program was initiated by the ODWC in 1967 as a way to encourage fisherman access to the River on public lands. (Smith, 1971). By 1971, the ODWC had developed eight access areas totaling 745 acres. The developments at these access areas included camping, picnicking, fishing and floating. Most of the areas included primitive toilet and trash facilities. A weekly "Illinois River Campfire Program" was conducted to aid in River usage and to convey proper River etiquette. Smith stated:

> *"Resulting from a concern over environmental deterioration, the effort (IR Campfire Program) was initiated by the Wildlife Department and the Scenic Rivers Association."*

This program has continued to the present time.

An additional source of human waste products to the IRW from State facilities and operations was the historical use of pit-type privies on State-owned properties. Pit privies were in common usage on State owned and managed River Access Areas from 1967, when some pit privies were first installed, until the transition period started with privy replacement in 1982. These pit privies were designed to introduce wastewaters into the ground and were being utilized by the Plaintiffs. Construction of the below-ground portion of these privies initially followed the design described by the OSDH (OSDH, 1949). By personal knowledge, I am aware that this conceptual approach was being utilized during the period from 1969 until 1974. As a result of the dated design of these facilities, human wastes were being discharged in a manner which caused pollutant transport into groundwater and surface waters of the IRW (Wagner, 1997, OCC-068-0000637, OSRC-083-0001087). Current privy design specifies the collection and retention of all liquids and solids from usage, for eventual removal to a proper wastewater treatment facility as opposed to purposefully infiltrating the wastes into the subsurface.

This River Access program continued under the management authority of the ODWC until July 1 1980 when a transition program was initiated through a maintenance agreement between the ODWC and the OSRC to transfer control and management of the areas to the OSRC (Wint, 1980). Wint conceded in a letter to Gov. George Nigh that:

> *"the Round Hollow Access Area has not been maintained in a manner befitting a state area for several years."*

By February 1982, the OSRC was receiving advice from the Cherokee County Health Department on the need for "concrete vault" pit privies including a statement that privies must be located a minimum of 50 feet from the highest level of the River (Brix, 1982).

State Parks Lands and Operations

The Plaintiffs own or lease and operate four State Parks located within the IRW. Public usage and level of development vary greatly among these Parks. The largest and most complex is the Tenkiller State

Park located near the dam forming Tenkiller Ferry Reservoir, while the smallest is Adair State Park located in the Baron Fork drainage of the IRW. The remaining State Parks in the basin are Cherokee Landing and Natural Falls State Parks. The past and potential contributory issues with each Park will be discussed separately.

Lake Tenkiller State Park

Tenkiller State Park is a 1,190 acre facility located on Pine Creek Cove immediately adjacent to the eastern terminus of the Tenkiller Ferry Dam. The Park includes facilities for swimming, boating, SCUBA diving, fishing, camping, picnicking, nature programs, shopping, restaurants, a marina with complete fueling and retail sales facilities, RV parking and cabin accommodations (ODTR, 2008). The Park was initially established shortly after reservoir impoundment in 1953 and has served the state since that time as the largest and most comprehensive recreational development on Lake Tenkiller.

The current wastewater management facilities in the Park include eight large comfort stations, 39 rental cabins, two RV dump stations, eight lift stations, six lagoons at two locations, an extensive spray irrigation system and several thousand feet of force main piping. The lagoon systems were designed for total retention at both locations. However, the south lagoon system which receives the majority of public usage must be augmented through the use of spray irrigation to the interior of the lagoon dikes to promote evaporation thereby preventing the necessity of discharging (Ford Exhibit 28).

Tenkiller State Park began using effluent from the wastewater lagoons for greenbelt irrigation along roadways in 1977 as approved by the OSDH on February 14, 1977 (USACE-JD-009129). This irrigation approach was necessary because the capacity of the lagoons was insufficient and to prevent sewage flows into Lake Tenkiller. As noted in the request for approval, the OTRD has acknowledged the open discharge of effluent from these lagoons. They stated:

> *"These lagoons are not adequate in season to provide total retention. With this irrigation system there will be no further open discharge from these lagoons."*

The greenbelt irrigation action was also approved by the USCOE on April 1, 1977 (USACE-JD-00913) citing that:

> *"The environmental effects of these types of improvements (park upgrades) are included in the Environmental Impacts Statement from the operations and maintenance of Tenkiller Ferry Lake."*

This spray irrigation of the greenbelt areas apparently continued on as "as needed" basis until an inspection was conducted by the ODEQ personnel on July 22, 1999 as a result of a citizen complaint. On August 20, 1999, ODEQ informally informed the OTRD that multiple "deficiencies" were noted and would require a written response including proposed corrective actions. Included in the "deficiencies" were operating a land application lagoon system without a permit, lagoon retention cell is undersized, holding tank was under water, sewage flowage from a lift station into the lake, locks on electric boxes broken and sewage has been flowing downhill to the lake for some time . ODEQ also stated:

> *"Based upon our inspection of the facility referenced above, it appears that an evaluation of the entire state park wastewater system is necessary to determine its adequacy, including the secondary lagoon system."*

This letter resulted in a series of correspondences resulting in the two agencies signing a Memorandum of Agreement (MOA) dated February 4, 2000, which includes the allegations previously outlined and detailing a series of tasks and a schedule to correct the deficiencies by May 1, 2001. (Ford Exhibit 13) The OTRD did state in their letter of September 17, 1999, that:

> *"Until the lagoon expansion program can be completed, there will be a need to irrigate from the existing lagoons to avoid uncontrolled spillage."*

They proposed modifying the irrigation system to an "open pasture area, away from public use." However, the proposed area was still located within the IRW.

The response actions agreed to in the MOA were conducted over a five year period of time with multiple addenda regarding schedules and task modifications plus the filing of an Administrative Compliance Order (ACO) dated June 24, 2002, relating to Lake Tenkiller State Park and two additional facilities. This ACO required the reduction of public services under certain conditions until upgrades and new construction were completed by the OTRD. During construction of the new facilities, requests were documented and approved relating to the use of temporary facilities and a one-time land application of sewage sludge required by the removal of the original lagoons. The "one-time" land application of sludge was approved and permitted by the ODEQ on the "Neal Pack property" which is approximately two miles east of the Lake Tenkiller State Park lagoon system (Ford Exhibit 10). This site is within the IRW. Approximately 258 dry tons of sludge was placed on the property subsequent to ODEQ approval on December 17, 2001.

Additionally, a full time "Land Application of Non-industrial Wastewater" permit was issued by the ODEQ on March 10, 2003 for the purpose of evaporating lagoon sewage to improve the carrying capacity of the system (Ford Exhibit 11). The permit states:

> *"that land applying wastewater will be limited to the insides of dikes of wastewater lagoons."*

Mr. Alan Ford, OTRD, testifying on behalf of the State of Oklahoma in his deposition of June 30, 2008, stated that the current operation approach is to limit the spraying of lagoon wastewaters to areas that are "inside the slope of the lagoons." On August 2, 2008, the author viewed the lagoon site and noted the presence of the sprinkler heads for the land application system located sequentially on the top (horizontal) surface of the dike forming the lagoons. These sprinkler heads are located on the outside boundary of the lagoon dike and are intended to be operated in a manner to spray only to the inside of the dike (Page 10 of 14 Ford Exhibit 28). These plans state that:

> *"sprinkler heads shall be directed towards the interior of the lagoon cells and shall have spray patterns as……."*

Observations and photographs collected during my visit disputes Mr. Ford's assertion of compliance with the requirement that wastewater be applied only to the inside portions of the lagoon dikes. (Figure 16) The photograph clearly reveals the denser and greener growth of grasses downslope from each sprinkler head to the outside slope of the confinement area in violation of the permit requirements.

In summary, Lake Tenkiller State Park is, and has been, a heavily utilized public facility located in the IRW which attracts a large number of visitors on an annual basis, but is seasonably heavier during the warm months. The Park has been a contributor of phosphorus to Lake Tenkiller through both indirect routes (increased visitation, visitor contributions) and direct routes (land application of wastewater and sludge, direct sewage releases to the lake). The completion of wastewater treatment upgrades by 2004 coincides somewhat with similar POTW phosphorus reductions in the IRW.

Cherokee Landing State Park

Cherokee Landing State Park is a 146 acre facility on the north shore of Lake Tenkiller adjacent to State Highway 82 between Cookson and Tahlequah. It is located on USCOE property that is leased to the Plaintiffs. It has been in operation since 1958 and currently attracts a large number of visitors as a result of its location relative to Tahlequah and with easy access on Highway 82.

The Park includes picnicking, tent camping, group camping, RV parking, fishing access, and related facilities including a softball field. The wastewater collection facilities include three comfort stations (two four bay and one three bay) and an RV dump station. Wastewater is directed to a centralized lift station and pumped to a lagoon system that is located in an inaccessible area. The original facilities were constructed about 1958 with additional facilities added in the late 1980s (Alan Ford deposition, 7-21-08).